# Comparison of objective frontal analysis schemes using the NCEP reanalysis

Pandora Hope[1], Kevin Keay[1], and Ian Simmonds[2]

[1]Bureau of Meteorology, Melbourne, Victoria 3001, Australia
[2]School of Earth Sciences, The University of Melbourne, Victoria, 3010, Australia
p.hope@bom.gov.au

The objective identification analysis of cyclonic systems is now well established (e.g., Simmonds and Keay 2002, Wernli and Schwierz 2006, Neu et al. 2013). Among the important reasons for studying extratropical cyclones is their intimate association with precipitation (Rudeva and Gulev 2011). In recent times a considerably enhanced effort has gone into the objective analysis of fronts (e.g., Berry et al. 2011, Simmonds et al. 2012). The identification and tracking of fronts is a more difficult than for the case of cyclones, but arguably it offers more insights into synoptic activity and precipitation distribution (Hope et al. 2014).

We are analysing the behaviour of five rather different objective frontal analysis algorithms (based on, respectively, (1) shifts in 850-hPa winds, (2) gradients of temperature, (3) gradients of wet-bulb potential temperature, (4) pattern matching, and (5) a self-organizing map approach. A sixth method used a manual synoptic technique. A focus was on the critical winter period over part of the wheatbelt of southwest Western Australia (Fig. 1) for 1979-2006 using the NCEP-NCAR reanalysis. (Much of the winter rainfall over this region originates from frontal systems.) Most methods identify the same systems for a significant proportion of the time, while their association with rainfall is less clear. As demonstrated in Hope et al. (2014) we can conclude that automated techniques have great value in understanding frontal behaviour and can be used to identify the changes in the frequency of frontal systems through time and their consequences.

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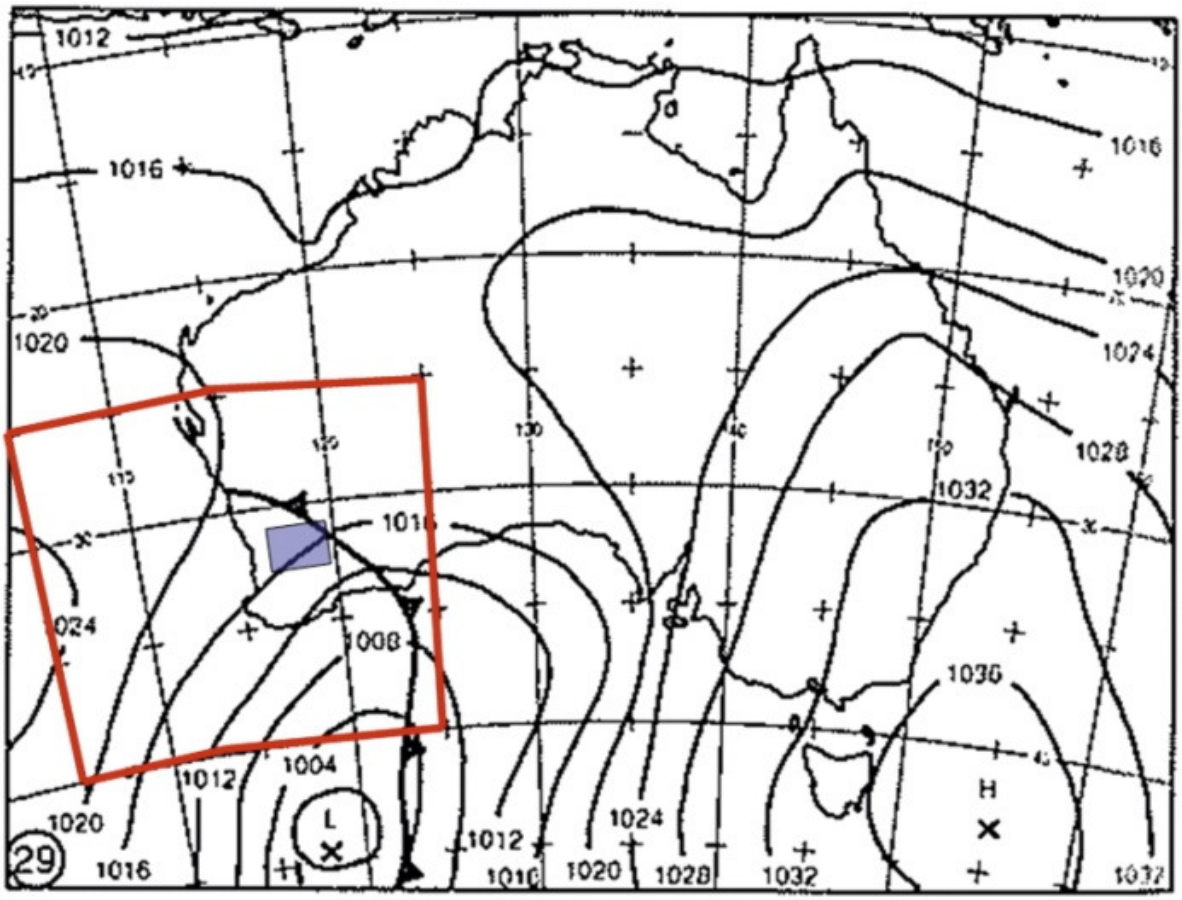


**Figure 1:** **Red** rectangle is region over which fronts are counted, and small **blue** region indicates wheatbelt region investigated here. The synoptic pattern shown is for the strong front of 29 June 1993.